PRTR Estimation Manual

13. Valve Manufacturing Industry

January 2001
Revised: March 2002

Japan Valve Manufacturers' Association

Contents

1. Class I Designated Chemical Substances (Class I Substances)

The main raw materials used in valve manufacturing processes, containing 1 mass percent or more of Class I Substances(0.1 mass percent or more for Specific Class I Substances) are shown in Table 1.

Table 1 Class I Substances related to valve manufacturing processes

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Casting material	Bronze casting	230	7439-92-1	Lead
2	Casting material	Brass casting	230	7439-92-1	Lead
3	Casting material	Bronze casting	178	7782-49-2	Selenium
4	Casting material	Iron casting	311	7439-96-5	Manganese
5	Casting material	Iron casting	68	7440-47-3	Chromium
6	Casting material	Iron casting	346	7439-98-7	Molybdenum
7	Casting material	Iron casting	231	7440-02-0	Nickel
8	Phenol resin	Molding/core sand binding	11	75-07-0	Acetaldehyde
9	Phenol resin	Molding/core sand binding	310	50-00-0	Formaldehyde
10	Phenol resin	Molding/core sand binding	266	108-95-2	Phenol
11	Phenol resin	Molding/core sand binding	63	1330-20-7	Xylene
12	Furan resin	Molding/core sand binding	266	108-95-2	Phenol
13	Furan resin	Molding/core sand binding	310	50-00-0	Formaldehyde
14	Degreasing /cleaning	Degreasing /cleaning	145	75-09-2	Dichloromethane
15	Metallic raw material	Raw material of bronze	230	7439-92-1	Lead
16	Metallic raw material	Raw material of brass	230	7439-92-1	Lead
17	Metallic raw material	Raw material of bronze	178	7782-49-2	Selenium
18	Metallic raw material	Raw material of iron	311	7439-96-5	Manganese
19	Metallic raw material	Raw material of iron	68	7440-47-3	Chromium
20	Metallic raw material	Raw material of iron	346	7439-98-7	Molybdenum
21	Metallic raw material	Raw material of iron	231	7440-02-0	Nickel
22	Plating liquid	Chromium plating liquid	69	7789-00-6	Chromium (VI) comp.
23	Plating liquid	Chromium plating liquid	68	1308-38-9	Chromium (III) comp.
24	Plating liquid	Chromium plating liquid	304	10043-35-3	Boron & its comp.
25	Plating liquid	Nickel plating liquid	232	3333-67-3 10101-98-1	Nickel compounds
26	Plating liquid	Copper plating liquid	207	7758-98-7	Copper salts (water soluble)
27	Solvent (adhesive)	Adhesion of resin parts	227	108-88-3	Toluene
28	Solvent (painting)	Painting of products	227	108-88-3	Toluene
29	Solvent (painting)	Painting of products	63	1330-20-7	Xylene

Note 1: Although chromium(III) compounds (dichromium trioxide) are not used as the raw material they are generated as a result of wastewater treatment of the plating solution containing chromium(VI) compounds (chromium trioxide).

2. Methods of Calculating PRTR Releases and Transfers

The chemical substances of which PRTR releases and transfers should be calculated are Class I Designated Chemical Substances contained 1 percent or more in raw materials (in case of specific Class I Designated Chemical Substances 0.1 percent or more).

For some facilities where emission factors shown in this manual are not suitable, calculation should be done by their own data, for example, by actual measurement, etc.

The amounts released, transferred, and shipped as products in each manufacturing process are calculated according to the following methods:

[1]Estimation of the releases to air:

(annual quantity of Class I Substances handled) × (emission factor to air)

[2]Estimation of the releases to water bodies:

(annual quantity of Class I Substances handled) × (emission factor to water bodies)

Note: Releases to water bodies are calculated as the amount released, and releases to sewerage are calculated as the amount transferred.

[3]Releases to soils: 0

Note: As no release to soils occurs in the valve manufacturing process, the amount released to soils is calculated as 0.

[4]Estimation of the transfers as waste:

(annual amount of waste containing the Class I Substances entrusted to waste disposal dealer) × (content of Class I Substances in waste)

[5]Estimation of the Amount recycled:

(annual amount of waste containing the Class I Substances handed over to recycle dealers) × (content of the Class I Substances)

[6]Estimation of the amount shipped as products

(annual quantity of materials handled containing the Class I Substances) × (content of Class I Substances) – (amount released to air) – (amount released/transferred to water bodies) – (the amount released to soils (0)) – (amount transferred as waste) – (amount recycled)

The annual quantity of Class I Substances handled is calculated using the following methods:

[1](annual quantity of materials handled)
= (stock at beginning of term) + (annual quantity purchased) – (stock at end of term)

[2]Content:

The average content based on the content of the Class I Designated Chemical Substances for each purchased lot of material should be used. However, when the maximum content is known and there is not a significant difference from the average content, the maximum content may be used for the average content. (Under the PRTR system, the maximum value is used instead of the intermediate value, based on the principle that risks should not be estimated at the lower side.)

Concerning the alloy in the melting process, the contents of the Class I Substances in the alloy are used.

[3](Annual quantity of Class I Substances handled)
= (annual handled quantity of materials containing Class I Substances) × (content of Class I Substances)

3. Flow Diagram of Valve Manufacturing Processes and Release points

Main valve manufacturing processes and release points are shown as follows.

3.1. Copper alloy valve (casting)

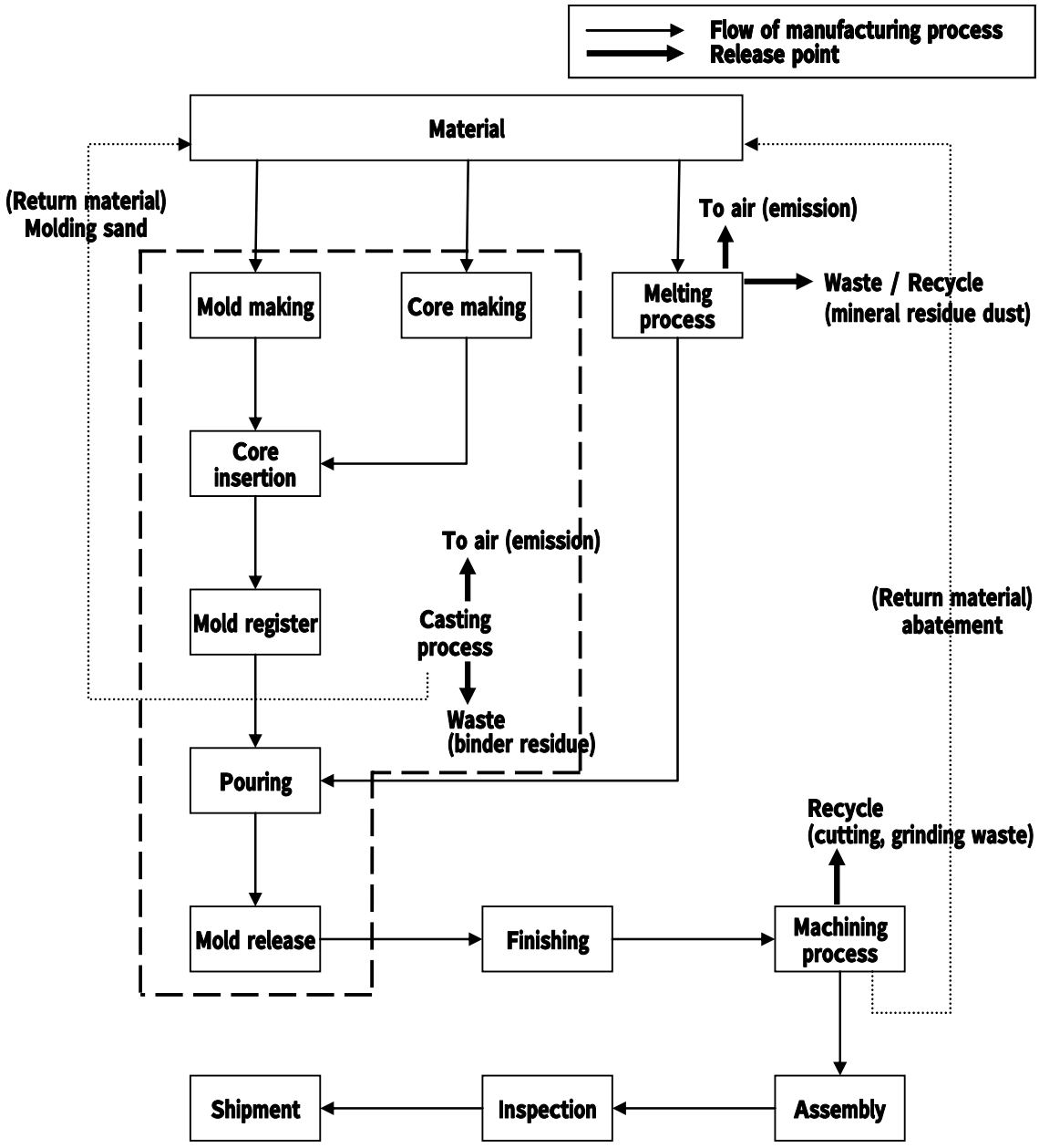


Figure 1. Copper alloy valve (casting)

3.2. Iron casting valve manufacturing process

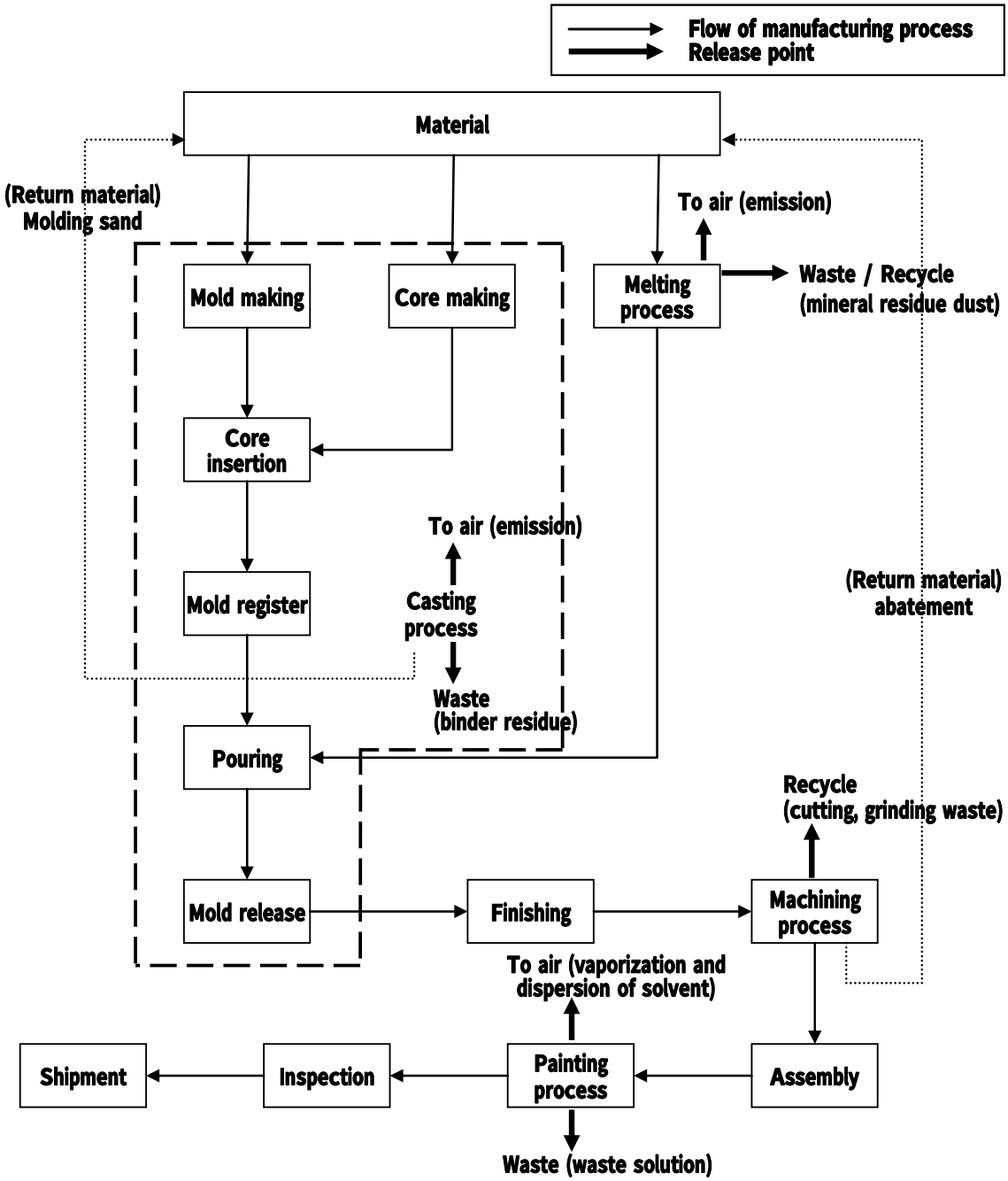


Figure 2. Iron casting valve manufacturing process

3.3. Steel casting valve manufacturing process

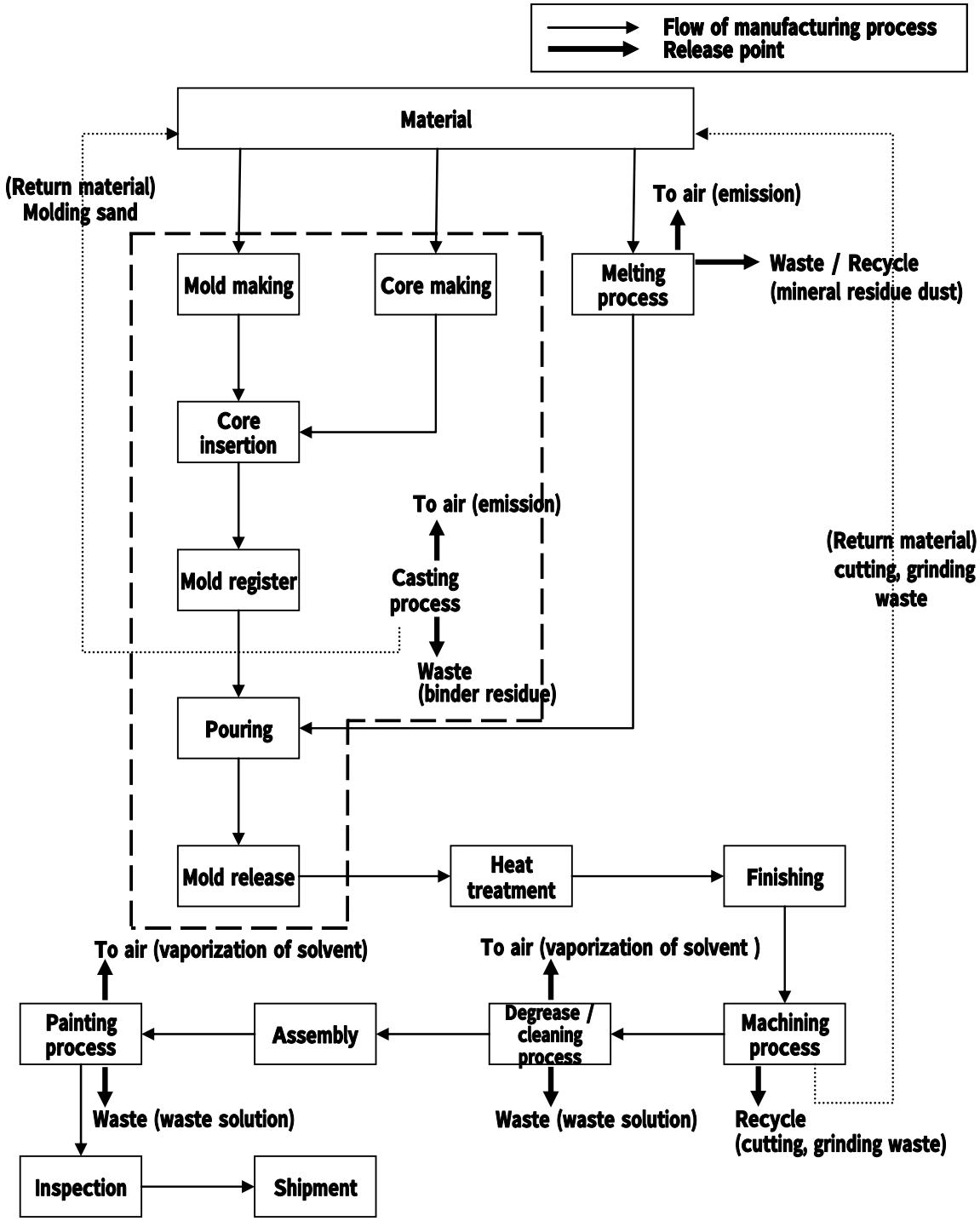


Figure 3. Steel casting valve manufacturing process

3.4. Stainless steel valve manufacturing process (casting)

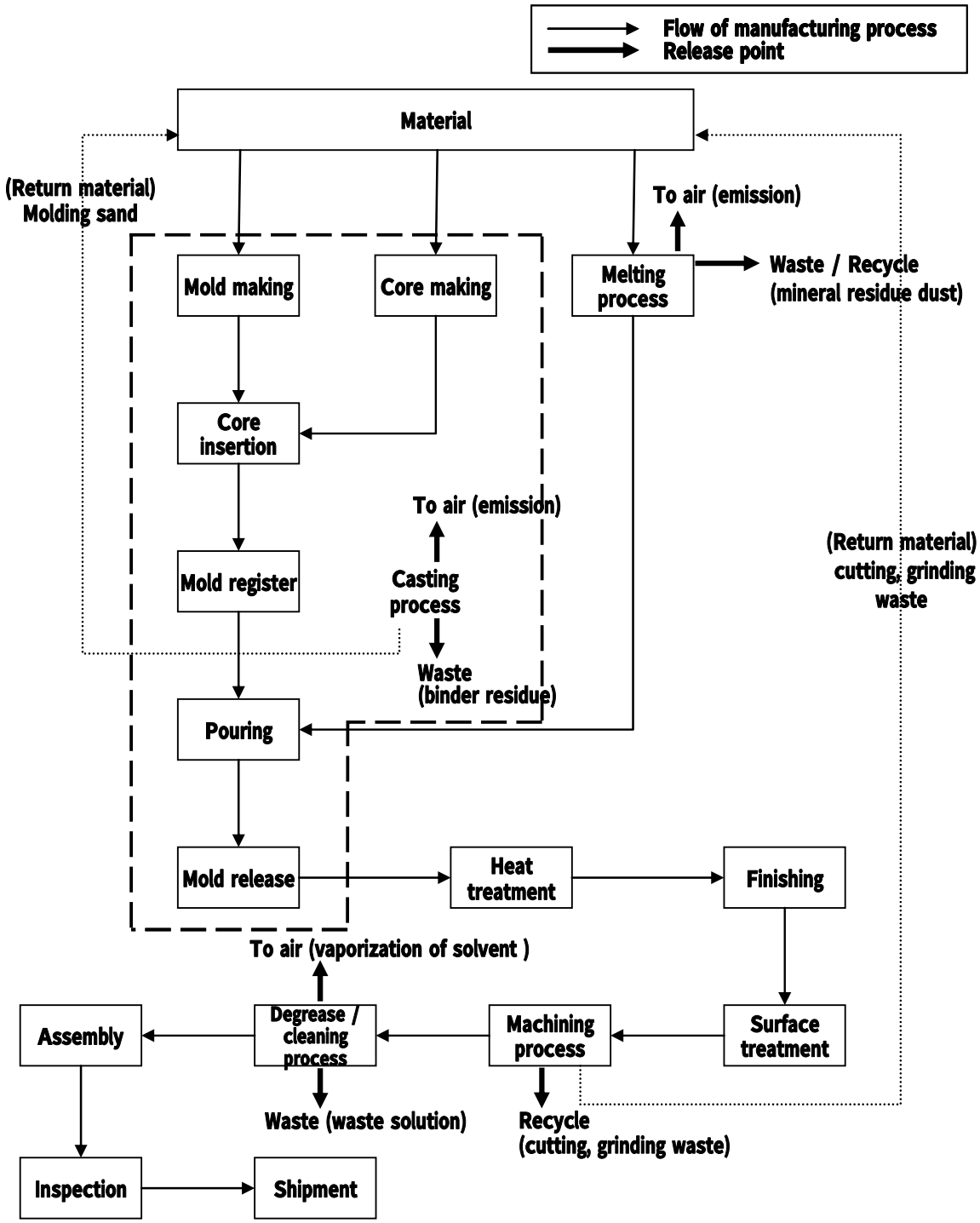


Figure 4. Stainless steel valve manufacturing process (casting)

3.5. Faucet manufacturing process

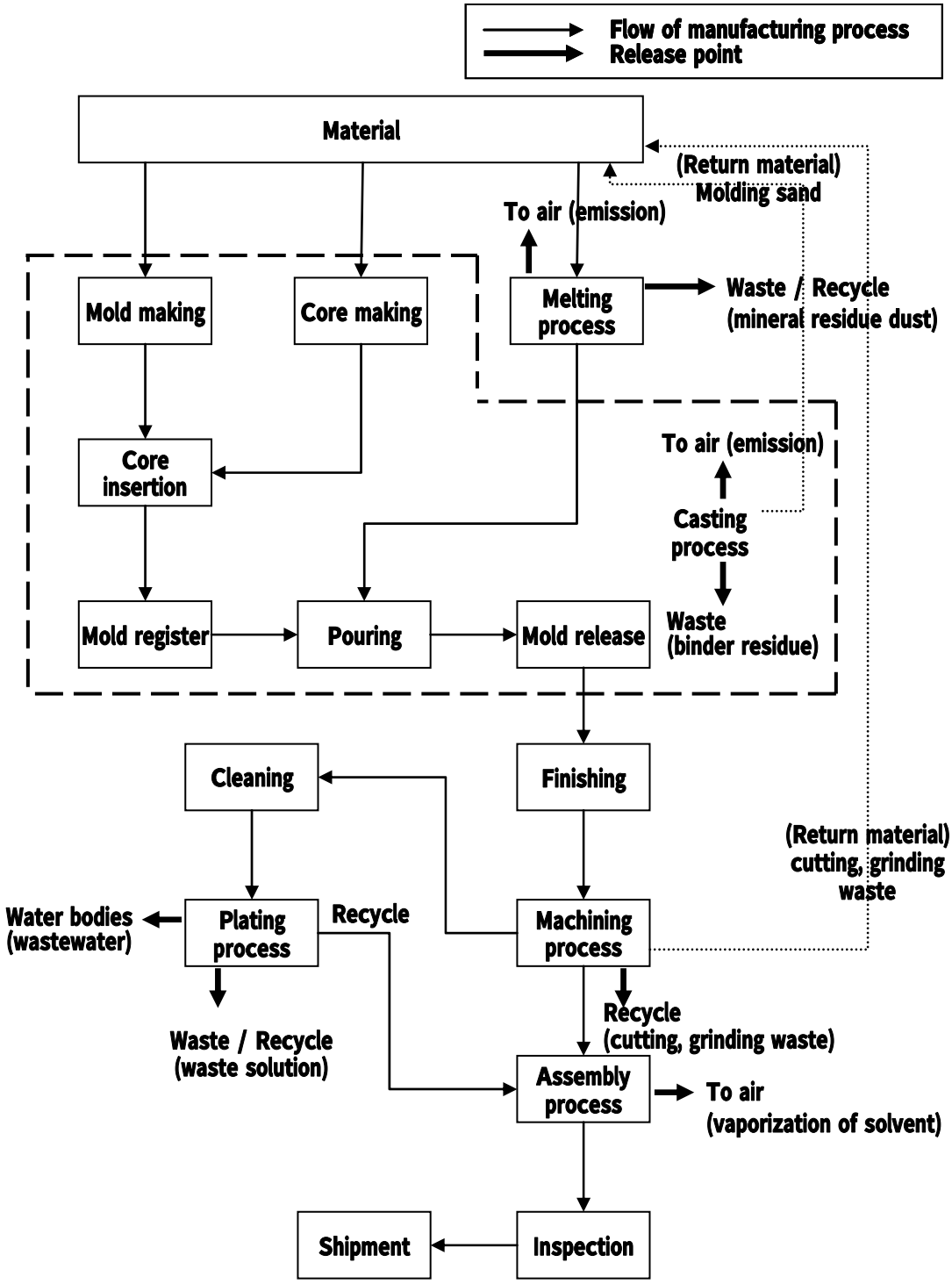


Figure5. Faucet manufacturing process

3.6. Forged valve manufacturing process

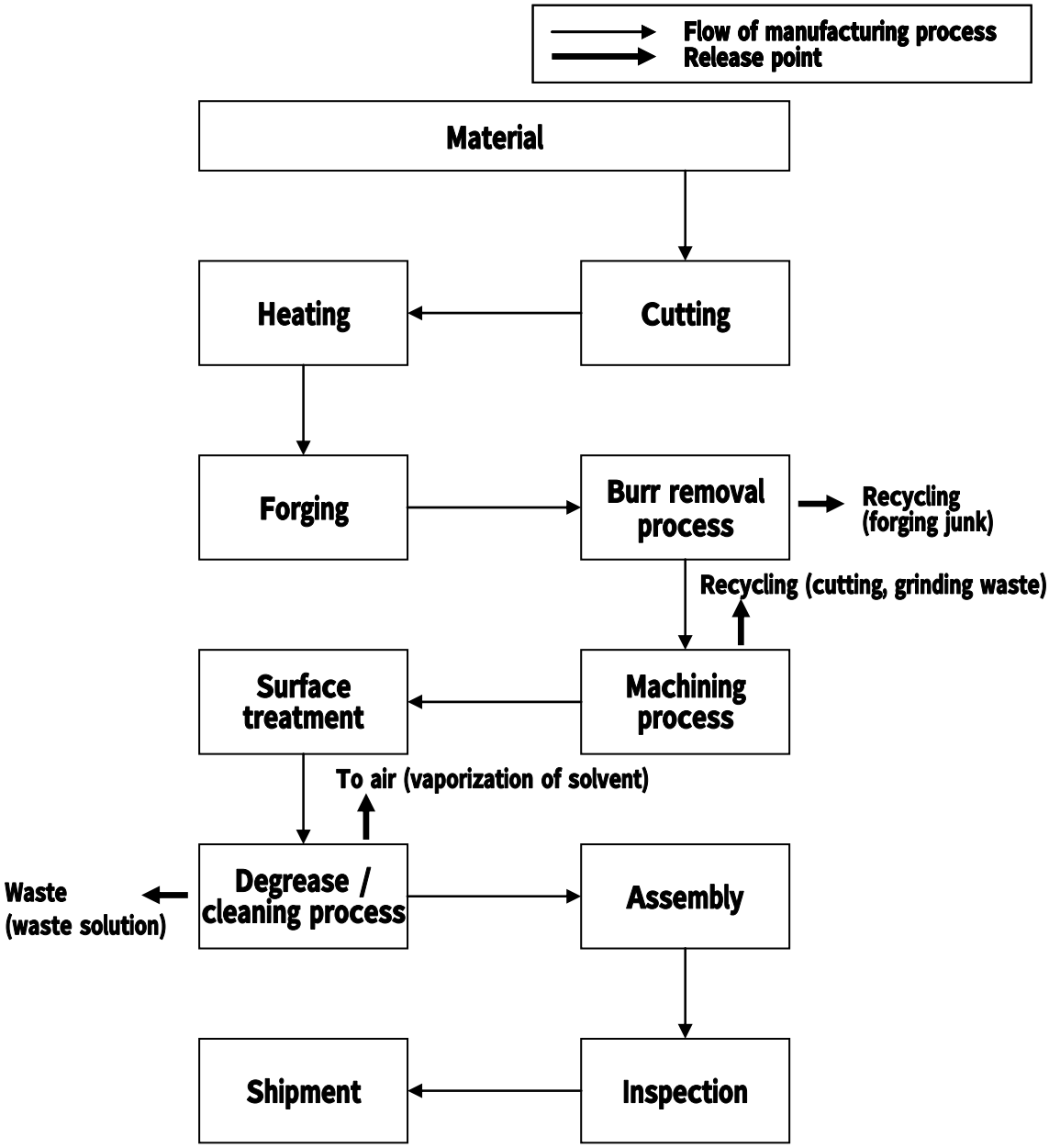


Figure 6. Forged valve manufacturing process

4. Methods and Examples of Calculating the Releases and Transfers in the Manufacturing Processes

Calculation examples of releases and transfers in valve manufacturing processes are those that follow.

In other processes not mentioned here, raw materials or materials containing Class I Substances are not used usually, or if used, the amount used is very small, so their examples are omitted.

4.1. Melting process

In the melting process, release to air, transfer as waste, the amount recycled and the amount shipped as product of Class I Substances are objectives of calculation.

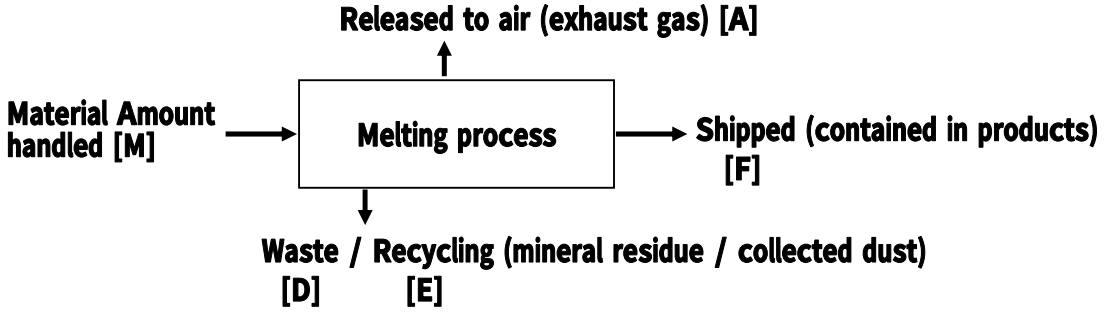
Main materials used in the melting process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.1.1.

In the melting process, content of Class I Designated Chemical Substance is content of Class I Substance contained in the molten alloy.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.1.2.

[Release flow chart]



・Annual handled quantity of the material containing the Class I Substances: M

[1] Releases to air:

A = [M] × [content of Class I Substances] × [emission factor to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste:

D = [annual amount of waste containing Class I Substances handed over to waste processors]

× [content of Class I Substances in waste]

[5] Amount recycled:

E = [annual amount of waste containing Class I Substances handed over to

recycle dealers]

× [content of Class I Substances in waste]

[6] Amount shipped as products:

F = [(M) × (content of Class I Substances)] – A – D – E

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the melting process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
○	×	×	○	○	○	×

Table 4.1.1 Main Class I Substances related to the melting process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Casting material	Bronze casting	230	7439-92-1	Lead
2	Casting material	Brass foundry	230	7439-92-1	Lead
3	Casting material	Bronze casting	178	7782-49-2	Selenium
4	Casting material	Iron casting	311	7439-96-5	Manganese
5	Casting material	Iron casting	68	7440-47-3	Chromium
6	Casting material	Iron casting	346	7439-98-7	Molybdenum
7	Casting material	Iron casting	231	7440-02-0	Nickel

Table 4.1.2 Emission factors of Class I Substances in the melting process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Lead (Bronze casting)	0.0001	0
2	Lead (Brass foundry)	0.00005	0
3	Selenium	0.0001	0
4	Manganese	0.0001	0
5	Chromium	0.0001	0
6	Molybdenum	0.0001	0
7	Nickel	0.0001	0

Note: Emission factors mentioned above are the result obtained by a survey conducted by Japan valve manufacturers' association (2000/12).

[Calculation example of amount of lead (bronze casting) released/transferred in the melting process]

Since lead in the melting process is not released to water bodies/soils, the

amount released to water bodies/land is calculated as zero.

[1] Estimation of the releases to air:

Annual handled quantity of the material containing lead: 3,500t

Content of lead: 5%

Emission factor of lead released to air: 0.0001

[Releases to air (A)]

= [annual handled quantity of material containing lead]
× [content of lead] × [emission factor for lead]

= 3,500t × 5% (0.05) × 0.0001 = 0.0175t

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] Estimation of transfers as waste:

Annual amount of waste containing lead handed over to industrial waste processors: 90t

Content of lead: 0.4% (slug 0.11%, collected dust 0.4%)

[Transfers as waste (D)]

= [annual amount of waste containing lead handed over to industrial waste processors]
× [content of lead]

= 90t × 0.4% (0.004)

= 0.36t

[5] Estimation of the amount sent as recycle:

Annual amount of waste containing lead handed over to recycle dealers: 1,450t

Content of lead: 0.5%

[Annual amount sent as recycle (E)]

= [annual amount of waste containing lead handed over to recycle dealers] × [content of lead]

= 1,450t × 0.5% (0.005) = 7.25t

[6] Estimation of the amount shipped as products:

Annual amount of the material handled containing lead: 3,500t

Content of lead: 0.5%

[Amount shipped as product (F)]

= [(annual handled quantity of material containing lead)
× (content of lead)] – A – D – E

= [3500t × 0.5% (0.005)] – 0.0175t – 0.36t – 7.25t = 9.89t

4.2. Casting process

In the casting process (mold-making, core molding, core insertion, mold assembly, pouring and mold release), releases to air and transfers as waste are the subject to be calculated.

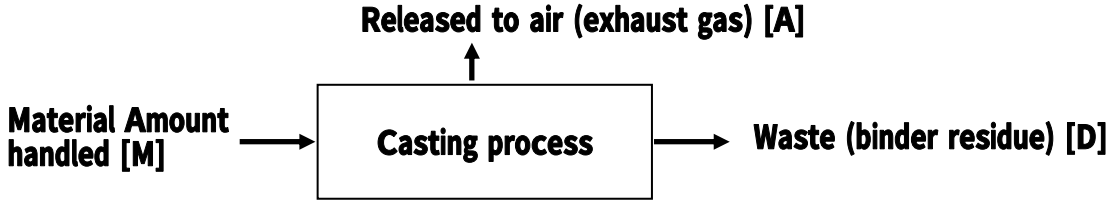
It is noted, however, although a large amount of waste mold sand is generated in this casting process, waste mold sand is returned to the process for reuse. Also, the waste mold sand that cannot be recycled are disposed as waste, and because the content of Class I Designated Chemical Substances in waste mold sand is less than 1 percent (less than 0.1 percent for specific Class I Designated Chemical Substances), they are omitted from the calculation.

Main materials used in the casting process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.2.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.2.2.

[Release flow chart]



・Annual handled quantity of the material containing Class I Substances: M

[1] Releases to air:

A = [M] × [content of Class I Substances] × [emission factor to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste:

D = [annual amount of waste containing Class I Substances handed over to waste processors]
× [content of Class I Substances in waste]

[5] Amount recycled:

E = 0

[6] Amount shipped as products:

F = 0

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the casting process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
○	×	×	○	×	×	×

Table 4.2.1 Main Class I Substances related to the casting process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Phenol resin	Molding/core sand binding	11	75-07-0	Acetaldehyde
2	Phenol resin	Molding/core sand binding	310	50-00-0	Formaldehyde
3	Phenol resin	Molding/core sand binding	266	108-95-2	Phenol
4	Phenol resin	Molding/core sand binding	63	1330-20-7	Xylene
5	Furan resin	Molding/core sand binding	266	108-95-2	Phenol
6	Furan resin	Molding/core sand binding	310	50-00-0	Formaldehyde

Table 4.2.2 Emission factors of Class I Substances in the casting process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Acetaldehyde	0.005	0
2	Formaldehyde	0.005	0
3	Xylene	0.005	0
4	Phenol	0.005	0

Note: Emission factors mentioned above are the result obtained by a survey conducted by Japan valve manufacturers' association (2000/12).

[Calculation example of amount of formaldehyde released/transferred in the casting process]

Since formaldehyde in the casting process is not released to water bodies/soils, or recycled and shipped as products, the amount released to water bodies/land, recycled and shipped as products is calculated as zero.

[1] Estimation of the releases to air:

Annual handled quantity of the material containing formaldehyde: 10t

Content of formaldehyde: 20%

Emission factor of formaldehyde released to air: 0.005

[Releases to air (A)]

= [annual handled quantity of material containing formaldehyde]
× [content of formaldehyde] × [emission factor for formaldehyde]
= 10t × 20% (0.20) × 0.005 = 0.01t

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] Estimation of transfers as waste:

Annual handled quantity of the material containing formaldehyde: 10t

Content of formaldehyde: 20%

[Transfers as waste (D)]

Formaldehyde in this process is either released to air or transferred into waste, the amount transferred as waste is calculated by subtracting the annual amount released to air from annual quantity handled, that is:

= [annual handled amount of material containing formaldehyde]
× [content of formaldehyde] – A
= 10t × 20% (0.20) – 0.01t
= 1.99t

[5] Estimation of the amount sent as recycle (E): 0

[6] Estimation of the amount shipped as products (F): 0

4.3. Machining process

Class I Designated Chemical Substances in the machining process are mostly those contained in the metallic raw materials. Class I Substances are not contained in lubrication oil or in cutting oil used in this process, or, if contained, they are contained at very low level, so they are omitted from the calculation example.

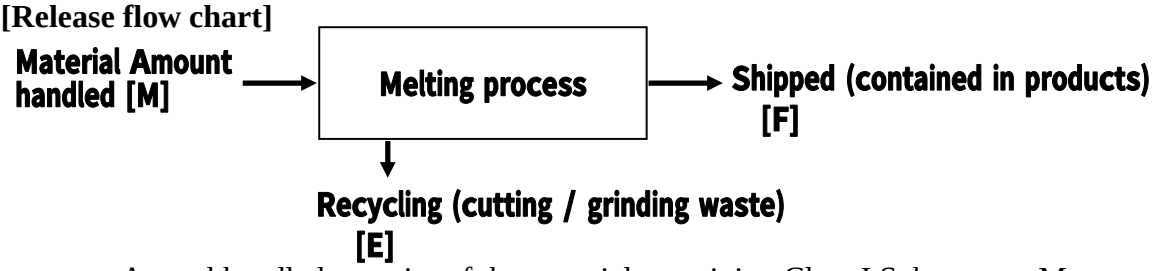
Further, the recycle of the designated substances and the product shipment are the subject of calculation in this machining process.

In addition, cutting waste or grinding waste generated in this process is returned to the process and reused.

Main materials used in the machining process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.3.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

[Release flow chart]



Annual handled quantity of the material containing Class I Substances: M

[1] Releases to air:

A = [M] × [content of Class I Substances] × [emission factor; release to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste: D = 0

[5] Amount recycled:

E = [annual amount of waste containing Class I Substances sold to recycle dealers] × [content of Class I Substances in waste]

[6] Amount shipped as products:

F = [M] × [content of Class I Substances] – E

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the machining process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
×	×	×	×	○	○	×

Table 4.3.1 Main Class I Substances related to the machining process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Casting material	Bronze casting	230	7439-92-1	Lead
2	Casting material	Brass foundry	230	7439-92-1	Lead
3	Casting material	Bronze casting	178	7782-49-2	Selenium
4	Casting material	Iron casting	311	7439-96-5	Manganese
5	Casting material	Iron casting	68	7440-47-3	Chromium
6	Casting material	Iron casting	346	7439-98-7	Molybdenum
7	Casting material	Iron casting	231	7440-02-0	Nickel

[Calculation example of amount of lead (bronze casting) released/transferred in the machining process]

Since lead in the machining process is not released to air, water bodies or soils, the amount released to air, water bodies or land is calculated as zero.

[1] [Releases to air (A)]: 0

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] [Transfers as waste (D)]: 0:

[5] Estimation of the amount sold as recycle:

Annual amount of waste containing lead handed over to recycle dealers: 595t

Content of lead: 5%

[Annual amount sold as recycle (E)]

= [annual amount of waste containing lead sold to recycle dealers] × [content of lead]

= 595t × 5% (0.05) = 29.8t

[6] Estimation of the amount shipped as products:

Annual amount of the material handled containing lead: 2,050t

Content of lead: 5%

[Amount shipped as product (F)]

= [(annual handled quantity of material containing lead)

× (content of lead)] – E

= [2,050t × 5% (0.05)] – 29.8t = 72.7t

4.4. Process of removing burr

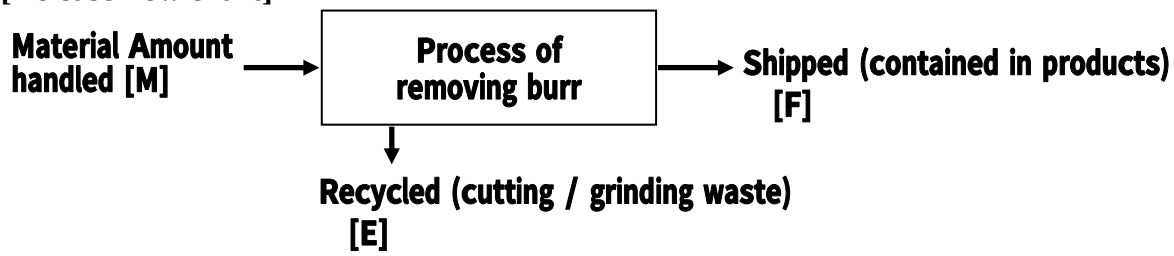
Class I Designated Chemical Substances in the process of removing burr are mostly those contained in the metallic raw materials. Class I Substances are not contained in lubrication oil or in cutting oil used in this process, or, if contained, they are contained at very low level, so they are omitted from the calculation example.

Further, the recycle of the designated substances and the product shipment are the subject of calculation in this process.

Main materials used in the process of removing burr containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.4.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

[Release flow chart]



Annual handled quantity of the material containing Class I Substances: M

[1] Releases to air: A = 0

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste: D = 0

[5] Amount recycled:

E = [annual amount of waste containing Class I Substances sold to recycle dealers] × [content of Class I Substances in waste]

[6] Amount shipped as products:

F = [M] × [content of Class I Substances] – E

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the process of removing burr; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
×	×	×	×	○	○	×

Table 4.4.1 Main Class I Substances related to the process of removing burr

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Casting material	Brass forging	230	7439-92-1	Lead
2	Casting material	Iron forging	311	7439-96-5	Manganese
3	Casting material	Iron forging	68	7440-47-3	Chromium
4	Casting material	Iron forging	346	7439-98-7	Molybdenum
5	Casting material	Iron forging	231	7440-02-0	Nickel

[Calculation example of amount of nickel released/transferred in the process of removing burr]

Since nickel in the process of removing burr is not released to air, water bodies, soils, and transferred into waste, the amount released to air, water bodies and land, and the amount transferred as waste are calculated as zero.

[1] [Releases to air (A)]: 0

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] [Transfers as waste (D)]: 0:

[5] Estimation of the amount sold as recycle:

Annual amount of waste containing nickel sold to recycle dealers: 837t

Content of nickel: 1%

[Annual amount sold as recycle (E)]

= [annual amount of waste containing nickel sold to recycle dealers] × [content of nickel]

= 837t × 1% (0.01) = 8.37t

[6] Estimation of the amount shipped as products:

Annual amount of the material handled containing nickel: 4,650t

Content of nickel: 1%

[Amount shipped as product (F)]

= [(annual handled quantity of material containing nickel) × (content of nickel)] – E

= [4,650t × 1% (0.01)] – 8.37t = 38.1t

4.5. Degreasing and cleaning process

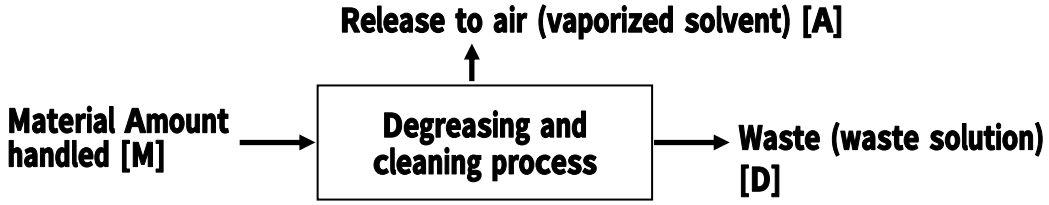
In the degreasing and cleaning process the annual quantity released to air and transferred into waste are the subject of calculation.

Main materials used in the degreasing and cleaning process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.5.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.5.2.

[Release flow chart]



Annual handled quantity of the material containing Class I Substances: M

[1] Releases to air:

A = [M] × [content of Class I Substances] × [emission factor; release to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste:

D = [annual amount of waste containing Class I Substances handed over to waste processors]

× [content of Class I Substances in waste]

[5] Amount recycled: E = 0

[6] Amount shipped as products: F = 0

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in degreasing and cleaning process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
○	×	×	○	×	×	×

Table 4.5.1 Class I Substances related to degreasing and cleaning process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Degreasing /cleaning solvent	Parts of Degreasing /cleaning	145	75-09-2	Dichloromethane

Table 4.5.2 Emission factor for Class I Substances in degreasing and cleaning process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Dichloromethane	0.8	0

Note: Emission factors mentioned above are the result obtained by a survey conducted by Japan valve manufacturers' association (2000/12).

[Calculation example of amount of dichloromethane released/transferred in the degreasing and cleaning process]

Since dichloromethane in the degreasing and cleaning process is not released to water bodies nor soils, and not recycled nor shipped as products. So the amount released water bodies and land, and the amount recycled and shipped as products are calculated as zero.

[1] Estimation of the release to air:

Annual handled quantity of the material containing dichloromethane: 3t

Content of dichloromethane: 100%

Emission factor of dichloromethane released to air: 0.8

[Releases to air (A)]

= [annual handled quantity of the material containing dichloromethane] × [content of dichloromethane] × [emission factor for dichloromethane]

= 3t × 100% (1) × 0.8 = 2.4t

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] Estimation of the annual amount transferred as waste:

Annual handled quantity of the material containing dichloromethane: 3t

Content of dichloromethane: 100%

[Annual amount transferred as waste (D)]:

As dichloromethane is either released to air or transferred into waste, the amount transferred as waste is calculated by subtracting the annual amount released to air from the annual quantity handled, that is:

= [annual handled quantity of the material containing dichloromethane] × [content of dichloromethane] – A

= 3t × 100% (1) – 2.4t = 0.6t

[5] [Annual amount sold as recycle (E)]: 0

[6] [Annual amount shipped as products (F)]: 0

4.6. Plating process

In the plating process, the Class I Designated Chemical Substances which are released to water bodies, transferred into waste, recycled, and shipped as products are the subject of calculation.

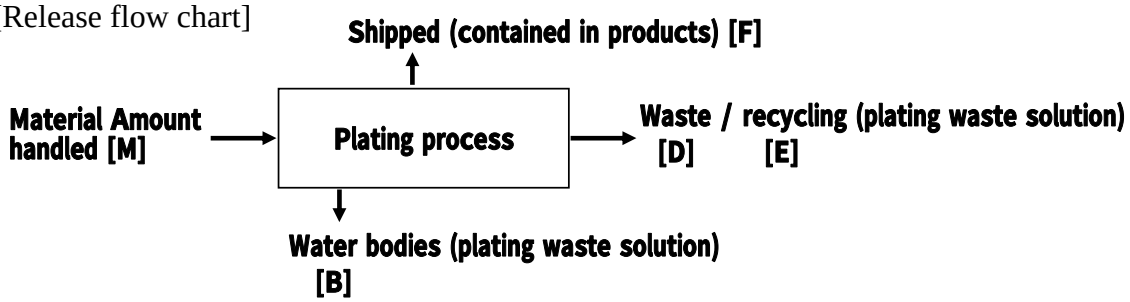
Main materials used in the plating process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.6.1.

As chromium(VI) compounds and nickel compounds are designated as the Specific Class I Designated Chemical Substances, materials containing 0.1% or more of them should be notified.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.6.2.

[Release flow chart]



Annual used amount of the material containing the Class I Substances: M

[1] Releases to air: A = 0

[2] Releases to water bodies:

B = [M] × [content of Class I Substances] × [emission factor to water bodies]

Note: Release to water bodies is the amount released, and release to sewerage is the amount transferred.

[3] Releases to soils: C = 0

[4] Transfers as waste:

D = [annual amount of waste material containing Class I Substances handed over to industrial waste processors]
× [content of Class I Substances]

[5] Amount sent as recycle:

E = [annual amount of waste material containing Class I Substances handed over to recycle dealers]
× [content of Class I Substances]

[6] Amount shipped as products:

F = [(M) × (content of Class I Substances)] – B – D – E

[7] Amount in landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Presence of releases and transfers in the plating process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
×	○	×	○	○	○	×

Table 4.6.1 Class I Substances related to the plating process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Plating liquid	Chromium plating liquid	69	7789-00-6	Chromium (VI) comp.
2	Plating liquid	Chromium plating liquid	68	1308-38-9	Chromium (III) comp.
3	Plating liquid	Chromium plating liquid	304	10043-35-3	Boron & its comp.
4	Plating liquid	Nickel plating liquid	232	3333-67-3 10101-98-1	Nickel compounds
5	Plating liquid	Copper plating liquid	207	7758-98-7	Copper salts (water soluble)

Table 4.6.2 Emission factor for Class I Substances in plating process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Chromium (VI) compounds	0	0
2	Chromium (III) compounds	0	0.001
3	Boron & its compounds	0	0.004
4	Nickel compounds	0	0.0006
5	Copper salts (water soluble)	0	0.0006

Note: 1. Emission factors mentioned above are the result obtained by a survey conducted by Japan valve manufacturers' association (2000/12).

2. As plating liquid is not released to air, emission factor to air of Class I Substances in this table is supposed to be zero.

3. For the case where the waste liquids containing chromium(VI) compounds are treated by reduction-coagulating precipitation process, chromium compounds other than the hexavalent are generated as sludge and therefore their amount must be calculated separately from the chromium(VI) compounds.

[Calculation example of the amount of chromium(III) compounds (dichromium trioxide) released/transferred in the plating process]

Since chromium(III) compounds in the plating process is not released to air or soils, the releases to air and the releases to soils are calculated as zero.

In this plating process, as waste liquids containing chromium(VI) compounds (chromium trioxide) is subjected to reduction-coagulating precipitation treatment, a chromium(III) compound (dichromium trioxide) is generated.

[1] [Releases to air (A)]: 0

[2] Estimation of releases to water bodies:

Annual handled quantity of the material containing chromium(VI) compounds: 5t

Content of chromium(VI) compounds: 99% or more

Emission factor for chromium(III) compound released to water bodies: 0.001

[Releases to water bodies (B)]

= [annual handled quantity of the material containing chromium(VI) compounds]
× [content of chromium(VI) compounds]
× [emission factor for chromium(III) compound released to water bodies]

= 5t × 99% (0.99) × 0.001

= 0.0050t

Note: Since this is released to sewerage, this should be a transfer to sewerage and not a release to water bodies.

[3] [Releases to soils: (C)]: 0

[4] [Transfers as waste (D)]: 0

Since waste liquid from the plating process is not disposed of as waste, but entirely recycled, the transfer as waste is zero.

[5] Estimation of the amount sent as recycle:

Annual amount of the waste containing chromium(III) compounds, which is handed over to recycle dealers: 5t

Content of chromium(III) compounds: 10%

[Amount sent as recycle (E)]

= [annual amount of waste containing chromium(III) compounds handed over to recycle dealers]
× [content of chromium(III) compounds]

= 5t × 10% (0.1) = 0.5t

[6] Estimation of the amount shipped as products:

Annual handled quantity of the material containing chromium(VI) compounds: 5t

Content of chromium(VI) compounds: 100%

[Amount shipped as product (F)]

= [(annual handled quantity of the material containing chromium(VI) compounds)

× (content of chromium(VI) compounds] – B – E

= [5t × 100% (1)] – 0.005t – 0.5t = 4.495t

4.7. Assembly process

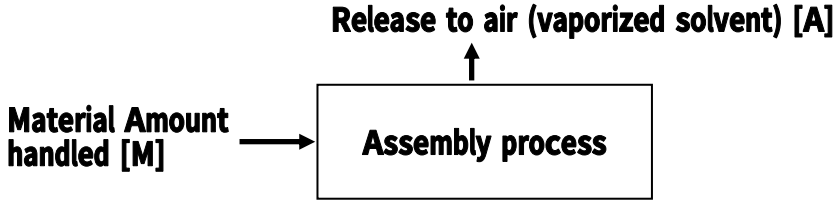
In assembly process, only the release to air is the subject of calculation.

Main materials used in assembly process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.7.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.7.2.

[Release flow chart]



[1] Releases to air: A = [M] × [content of Class I Substances]
× [emission factor; release to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste: D = 0

[5] Amount recycled: E = 0

[6] Amount shipped as products: F = 0

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the assembly process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
○	×	×	×	×	×	×

Table 4.7.1 Class I Substances related to the assembly process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Solvent (adhesive)	Adhesion of resin parts	227	108-88-3	Toluene

Table 4.7.2 Emission factor for Class I Substances in assembly process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Toluene	1	0

Note: 1. Emission factor mentioned above are the result obtained from a survey by Japan valve manufacturers' association (2000/12).

2. As very little amount is released to water bodies or transferred into waste for toluene used in this process, emission factor of release to water bodies and transfer into waste is supposed to be zero for toluene.

[Calculation example of amount released/transferred of toluene in the assembly process]

Since toluene in the assembly process is not released to water bodies nor soils, and not recycled nor shipped as products, the amount released to water bodies and soils, the amount transferred into waste and recycle, and the amount shipped as products are calculated as zero.

[1] Estimation of the release to air:

Annual handled quantity of toluene contained in the material: 1t

Emission factor of toluene released to air: 1

[Releases to air (A)]

= [annual handled quantity of the material containing toluene]

× [content of toluene] × [emission factor to air]

= 1t × 100% (1) × 1 = 1t

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] [Annual amount transferred as waste (D)]: 0

[5] [Annual amount sold as recycle (E)]: 0

[6] [Annual amount shipped as products (F)]: 0

4.8. Painting process

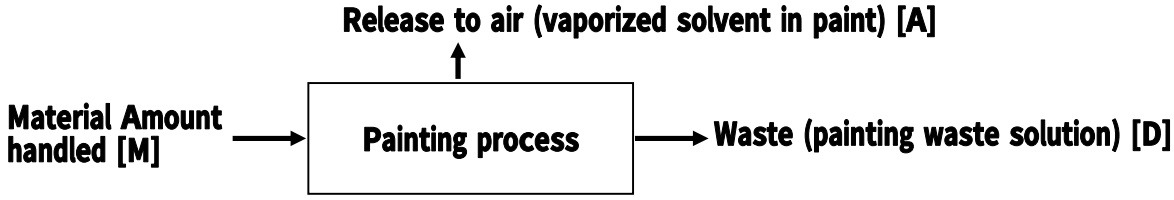
In painting process, release to air, transfer as waste and amount shipped as products are the subjects of calculation.

Main materials used in painting process containing 1 percent or more of Class I Designated Chemical Substances are shown in Table 4.8.1.

However, there are some cases where other Class I Substances are contained in the raw materials purchased by the manufacturers. Thus it should be confirmed whether or not any other designated substances are contained in the purchased raw materials, along with their content.

Emission factors for the main Class I Substances are shown in Table 4.8.2.

[Release flow chart]



[1] Releases to air: A = [M] × [content of Class I Substances]
× [emission factor to air]

[2] Releases to water bodies: B = 0

[3] Releases to soils: C = 0

[4] Transfers as waste:

D = [annual amount of waste containing Class I Substances handed over to industrial waste processors]
× [content of Class I Substances]

[5] Amount sent as recycle: E = 0

[6] Amount shipped as products: F = 0

[7] Amount of landfills: G = 0

Note: The amount of landfills refers to the on-site controlled type landfills.

[Releases and transfers in the painting process; ○: yes, ×: no]

Air	Water bodies	Soils	Waste	Recycling	Products	Landfills
○	×	×	○	×	○	×

Table 4.8.1 Class I Substances related to the painting process

No.	Raw material	Use	Cabinet order no.	CAS No.	Name of substance
1	Solvent (painting)	Painting of products	227	108-88-3	Toluene
2	Solvent (painting)	Painting of products	63	1330-20-7	Xylene

Table 4.8.2 Emission factors of Class I Substances in the painting process

No.	Name of substance	Emission factor of Class I substance	
		Air emission	Water bodies
1	Toluene	1	0
2	Xylene	0.7	0

Note: 1. Emission factors mentioned above are the result obtained by a survey conducted by Japan valve manufacturers' association (2000/12).

2. As very little amount is released to water bodies for toluene and xylene from this process, emission factor of release to water bodies is supposed to be zero.

[Calculation example of amount of xylene released and transferred in the painting process]

Since in this process xylene is not released to water bodies nor soils, and not recycled, the amount released to water bodies and soils, and the amount recycled are calculated as zero.

[1] Estimation of the release to air:

Annual handled quantity of the material containing xylene: 30t

Content of xylene: 20%

Emission factor of xylene released to air: 0.7

[Releases to air (A)]

= [annual handled quantity of the material containing xylene]

× [content of xylene] × [air emission factor for xylene]

= 30t × 20% (0.2) × 0.7 = 4.2t

[2] [Releases to water bodies (B)]: 0

[3] [Releases to soils (C)]: 0

[4] Calculation of Annual amount transferred as waste (D)

Annual handled quantity of the material containing xylene: 30t

Content of xylene: 20%

[Annual amount transferred as waste (D)]:

As xylene is either released to air or transferred into waste, the amount

transferred as waste is calculated by subtracting the annual amount released to air from the annual quantity handled, that is:

= [annual handled quantity of the material containing xylene]
× [content of xylene] – A

= 30t × 20 % (0.2) – 4.2t

= 1.8t

[5] [Annual amount sold as recycle (E)]: 0

[6] [Annual amount shipped as products (F)]: 0

Appendix: Emission factor for Class I Substances related to valve manufacturing processes

Emission factor for the main Class I Substances used in valve manufacturing processes, containing thereof by 1 mass percent or more(0.1 mass percent or more for Specific Class I Substances) are shown below.

Usually there is no release to soils in valve manufacturing processes, so, emission factor for release to soils is assumed to be zero.

Note: Emission factors above are surveyed by Japan valve manufacturers' association

No.	Use	Name of substance	Emission factor	
			Air	Water bodies
1	Bronze casting	Lead	0.0001	0
2	Brass foundry	Lead	0.00005	0
3	Bronze casting	Selenium	0.0001	0
4	Iron casting	Manganese	0.001	0
5	Iron casting	Chromium	0.001	0
6	Iron casting	Molybdenum	0.001	0
7	Iron casting	Nickel	0.001	0
8	Molding/core sand binding	Acetaldehyde	0.005	0
9	Molding/core sand binding	Formaldehyde	0.005	0
10	Molding/core sand binding	Xylene	0.005	0
11	Molding/core sand binding	Phenol	0.005	0
12	Degreasing /cleaning	Dichloromethane	0.8	0
13	Chromium plating liquid	Chromium (VI) compounds	0	0
14		Chromium (III) compounds	0	0.001
15	Nickel plating liquid	Boron & its compounds	0	0.004
16	Nickel plating liquid	Nickel compounds	0	0.0006
17	Copper plating liquid	Copper salts(water soluble)	0	0.0006
18	Adhesion of resin parts	Toluene	1	0
19	Painting of products	Toluene	1	0
20	Painting of products	Xylene	0.7	0